**Newton’s Law of Cooling**

A special type of differential equation is Newton’s Law of Cooling. In this law, instead of

the rate of cooling being proportional to the temperature of the substance, it is

proportional to the *difference* between the temperature of the substance and the

temperature of its surroundings.

The law can be modelled by the equation: ,

where is the temperature of the surroundings.

The general solution to this equation is: .

Example: The chemistry teacher pours herself a cup of coffee with water boiling at

100 0C. She measures the temperature in the lab to be 17 0C. After 3 minutes, her coffee

is 80 0C. How long will it take to cool to 50 0C?

* The temperature in the lab is 17 0C, so 17. So the general equation is now

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* Since the initial ( ) temperature of the coffee is 100 0C:

So and the general equation is now .

* Since the temperature of the coffee is 80 0C after 3 minutes:

So the general equation is now

* To find out how long it takes for the coffee to cool to 50 0C, substitute and solve for : mins.

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